Claims

What is claimed:

1. A resistance change sensor, comprising:

   a first input connected to a first resistance;

   a second input connected to a second resistance;

   a resistance detector for sensing a resistive change in at least one of the first resistance and the second resistance.

2. The resistance change sensor of claim 1, wherein the first resistance and the second resistance are load resistors of a cross-coupled pair of transistors forming a differential pair amplifier of the resistance change sensor.

3. The resistance change sensor of claim 1, wherein the first resistance is one of a high resistance and a low resistance, and the second resistance is the other of the high resistance and the low resistance.

4. The resistance change sensor of claim 1, wherein the resistive change is sensed by sampling a resistive state of the first resistance and the second resistance at a first time t1, and sampling the resistive state of the first resistance and the second resistance at a second time t2.

5. The resistance change sensor of claim 1, wherein the second resistance is a reference resistor.

6. The resistance change sensor of claim 5, wherein the resistive state sampled at first time t1 is stored in a first latch, and the resistive state sampled at the second time t2 is stored in a second latch.

7. The resistance change sensor of claim 6, wherein an output of the first latch and an output of the second latch are exclusively OR'd by an exclusive OR gate generating the sensor output.

8. The resistance change sensor of claim 6, wherein the first latch and the second latch comprise transistors that are formed so that the first latch and the second latch can latch non-standard voltage potential input signals while providing output signals that are standard voltage potential signals.

9. A magnetic sensing device comprising:

a first sensor input connected to a first tunneling magneto-resistive (TMJ) cell, the first TMJ cell including a first resistance;

a second sensor input connected to a second TMJ cell, the second TMJ cell including a second resistance; and

a detector for sensing a change in resistance of the first TMJ cell and the second TMJ cell.

10. The device of claim 9, wherein the first TMJ cell is a first MRAM cell, and the second TMJ cell is a second MRAM cell.

11. The device of claim 9, wherein the first TMJ cell is formed complimentary to the second TMJ cell.

12. The device of claim 9, wherein the first TMJ cell and the second TMJ cell are load resistors of a cross-coupled pair of transistors forming a differential pair amplifier of the magnetic sensing device.

13. The device of claim 9, the resistive change is sense by sampling a resistive state of the first TMJ cell and the second TMJ cell at a first time t1, and sampling the resistive state of the first TMJ cell and the second TMJ cell at a second time t2.

14. The device of claim 13, wherein the resistive state sampled at first time t1 is stored in a first latch, and the resistive state sampled at the second time t2 is stored in a second latch.

15. The device of claim 14, wherein an output of the first latch and an output of the second latch are exclusively OR'd by an exclusive OR gate generating a device output.

16. The device of claim 14, wherein the first latch and the second latch comprise transistors that are formed so that the first latch and the second latch can latch non-standard voltage potential input signals while providing output signals that are standard voltage potential signals.

17. A memory apparatus comprising

an array of MRAM cells;

a write current generator for generating a write current for selectively writing to MRAM cells within the array of MRAM cells;

a complimentary pair of test MRAM cells additionally coupled to the write current of the write current generator;

a complimentary MRAM cell resistive state sensor connected to the complimentary pair of test MRAM cells for detecting a change in resistance of the complementary pair of test MRAM cells.

18. The apparatus of claim 17, wherein the write current includes pulses that alternate in polarity.

19. The apparatus of claim 17, wherein the complimentary pair of test MRAM cells includes a first MRAM cell and a second MRAM cell, wherein the first MRAM cell and a second MRAM cell are load resistors of a cross-coupled pair of transistors forming a differential pair amplifier of the complimentary MRAM cell pair resistive state sensor.

20. The apparatus of claim 19, the resistive change is sense by sampling a resistive state of the first MRAM cell and the second MRAM cell at a first time t1, and sampling the resistive state of the first MRAM cell and the second MRAM cell at a second time t2.

21. The apparatus of claim 20, wherein the resistive state sampled at first time t1 is stored in a first latch, and the resistive state sampled at the second time t2 is stored in a second latch.

22. The apparatus of claim 21, wherein an output of the first latch and an output of the second latch are exclusively OR'd by an exclusive OR gate generating the sensor output.

23. The apparatus of claim 21, wherein the first latch and the second latch comprise transistors that are formed so that the first latch and the second latch can latch non-standard voltage potential input signals while providing output signals that are standard voltage potential signals.

24. A method of sensing a magnitude of a MRAM write current comprising:

applying an alternating polarity write current to a first MRAM cell and a second MRAM cell formed as a complimentary pair of test MRAM cells;

generating a differential amplifier output, wherein the first MRAM cell and a second MRAM cell are load resistors of a cross-coupled pair of transistors forming a differential pair amplifier;

sampling a first output of the differential pair amplifier and a first time t1, providing a representation of the write current at a first polarity;

sampling a second output of the differential pair amplifier and a second time t2, providing a representation of the write current at a second polarity;

exclusively OR'ing the first sampled output and the second sampled output thereby sensing a resistive changes of the first MRAM cell and the second MRAM cell.

25. The method of claim 24, wherein first MRAM cell and the second MRAM cells change resistive states when the magnitude of the MRAM write current exceeds a write current threshold, and the exclusively OR's output provides a threshold indicator.

26. A method of sensing a change of magnetic states using TMJ sensing elements, comprising:

applying a first magnetic field to the TMJ sensing elements;

sensing a first resistance state of a first TMJ element and a second TMJ element of the TMJ sensing elements;

storing the first resistance state;

applying a second magnetic field to the TMJ sensing elements;

sensing a second resistance state of a first TMJ element and a second TMJ element of the TMJ sensing elements;

storing the second resistance state; and

exclusive OR'ing the first resistance state and the second resistance state determining whether the first resistance state is different than the second resistance state.

27. The method of claim 26, wherein the first magnetic field is generated when the TMJ sensing elements are proximate a first location of a magnetic medium, and the second magnetic field is generated when the TMJ sensing elements are proximate a second location of the magnetic medium.

28. An apparatus for sensing a change of magnetic states using TMJ sensing elements, comprising:

means for applying a first magnetic field to the TMJ sensing elements;

means for sensing a first resistance state of a first TMJ element and a second TMJ element of the TMJ sensing elements;

means for storing the first resistance state;

means for applying a second magnetic field to the TMJ sensing elements;

means for sensing a second resistance state of a first TMJ element and a second TMJ element of the TMJ sensing elements;

means for storing the second resistance state; and

means for exclusive OR'ing the first resistance state and the second resistance state determining whether the first resistance state is different than the second resistance state.

29. A resistance change sensor, comprising:

a first input connected to a first resistance;

a second input connected to a second resistance;

a resistance detector for sensing a resistive change in at least one of the first resistance and the second resistance; wherein

at least one of the first resistance and the second resistance comprise at least one of a chemical-resistance sensitive device, a pressure-resistance sensitive device, a temperature-resistance device, and photo-resistive device.